The following chapter, devoted to the right triangle, introduces the ideas of orthogonal projection, vectors and areas of sectors and segments. The authors assume that the angles used in these latter discussions are less than a right angle, which is of course very unfortunate. By using the graphs of the trigonometric functions, the authors lead up to the idea of the addition theorems, and then in a natural way introduce the idea of the many-valuedness of an inverse function. In most places from this point on, only the principal value of the inverse function is used.

In the discussion of the general addition theorems, the proofs are given for *admittedly* special cases and no attempt is made to mislead the student into thinking that the proofs given are general. Some indications are given for the extension of the proofs. Identities, direct and inverse, based on these theorems conclude the chapter. Then come chapters on oblique triangles, trigonometric equations, and De Moivre's theorem including hyperbolic functions. In this latter chapter only the elements of the hyperbolic functions are given, the idea apparently being to give some place to which to refer when the future need for these functions shall occur. In the discussion of the De Moivre theorem, the authors use $j = \sqrt{-1}$ which is extremely unfortunate even though the book is primarily for technical students and $a + jb$ is the standard representation of a complex number in electrical theory.

The number of problems, many of which come from the applications, is large. The arrangement of the material in the chapters is generally good and natural. A rearrangement of the chapters themselves, so as to defer the solution of all triangles until the end of the book, seems desirable, the idea being that *occasionally* trigonometry is taught by teachers who have no proper perspective as to the future need for trigonometry in mathematics, over-emphasis being frequently given to the solution of triangles and more important subjects skimped.

C. F. CRAIG

Geometrical Researches on the Theory of Parallels. By NICHOLAUS LOBATSCHEVSKI. Translated from the original by GEORGE BRUCE HALSTED. New Edition. The Open Court Publishing Company, Chicago, 1914. 50 pages. $1.25.

This is a new edition of a work which appeared in 1891. The desirability that such classics of mathematical literature should be available even to those students who do not have command of any foreign language is recognized by mathematicians the world over. France and Germany have been unusually progressive in such matters, and Italy is just inaugurating a series of the classics. The beautiful simplicity of these masterpieces is a source of encouragement to young students to continue their studies. When a real interest is aroused in non-euclidean geometry or other topic, the study soon extends to the various fields of mathematical research which are so closely and so curiously inter-related. The student of the history of science is particularly interested in the fact that the names of Bolyai and Lobatschevski, independent workers, are indissolubly linked

with this wonderful development of geometry, while Gauss and even older writers like Saccheri were on the brink of the discovery. The possibility of the simultaneous discovery was not due entirely to the genius, great though it was, of the two fortunate individuals mentioned, but also to the many humble and obscure scientists who paved the way.

For those who desire to pursue further the subject of the book under discussion, H. S. Carslaw's translation of Roberto Bonola's "Non-Euclidean Geometry" is to be commended. It is published by the Open Court Publishing Company. Manning's "Non-Euclidean Geometry," published by Ginn and Company, Coolidge's "Elements of Non-Euclidean Geometry," published at Oxford in 1909, and Somerville's work with the same title are other available English books on the subject.

The paper and the printing of the book seem to be of distinctly inferior quality compared with that usually found in books with the same imprint. Some of the work seems to be from the old plates. The price is excessive for a fifty-page book. " Bibliography " is used in a misleading sense, as there is no bibliography given. The quotation in French on page 9 needs revision or explanation.

L. C. KARPINSKI.

Our Knowledge of the External World as a Field for Scientific Method in Philosophy. By BERTRAND RUSSELL. ix+245 pages. The Open Court Publishing Co., Chicago, 1914. $2.00.

The author distinguishes three types among present-day philosophies. The first of these, which he calls the classical tradition, descends in the main from Kant and Hegel. The second type, which is called evolutionism, derives its predominance from Darwin and reckons Herbert Spencer as its first philosophical representative but in recent times has been largely modified by William James and Henri Bergson. " The third type, which may be called logical atomism for want of a better name," says our author, " has gradually crept into philosophy through the critical scrutiny of mathematics. This type of philosophy . . . represents, I believe, the same kind of advance as was introduced into physics by Galileo: the substitution of piecemeal, detailed, and verifiable results for large untested generalities recommended only by a certain appeal to imagination."

It is to the third type of philosophy that the volume under review belongs. It should be of considerable interest to mathematicians not only from the fact that the methods employed have arisen from a critical scrutiny of mathematics but also because much of its detailed treatment is obviously inspired by the mathematical ideas and results of the past forty years.

This is not the place for a detailed review of the book, even though it is an important one. It should have a large circle of readers among both mathematicians and philosophers. On the work of the latter it will probably exert a wide influence.

R. D. CARMICHAEL.